

# **Reproductive and Developmental Hazards**

**[insert presenter info]**

# So What?

- ◎ **Congenital defects are the #1 cause of death in infants**
- ◎ **2-3% of newborns have a major anomaly requiring medical attention**



# What You Will Learn

- ① **Most important facts of reproductive and developmental toxicology**
- ① **Common chemical, drug, and physical hazards**
- ① **Sources of information to help you make decisions**

# What do these terms mean?

- ◎ Reproductive hazard - alters ability to conceive a child
- ◎ Developmental hazard - alters the structure or function of the fetus/baby

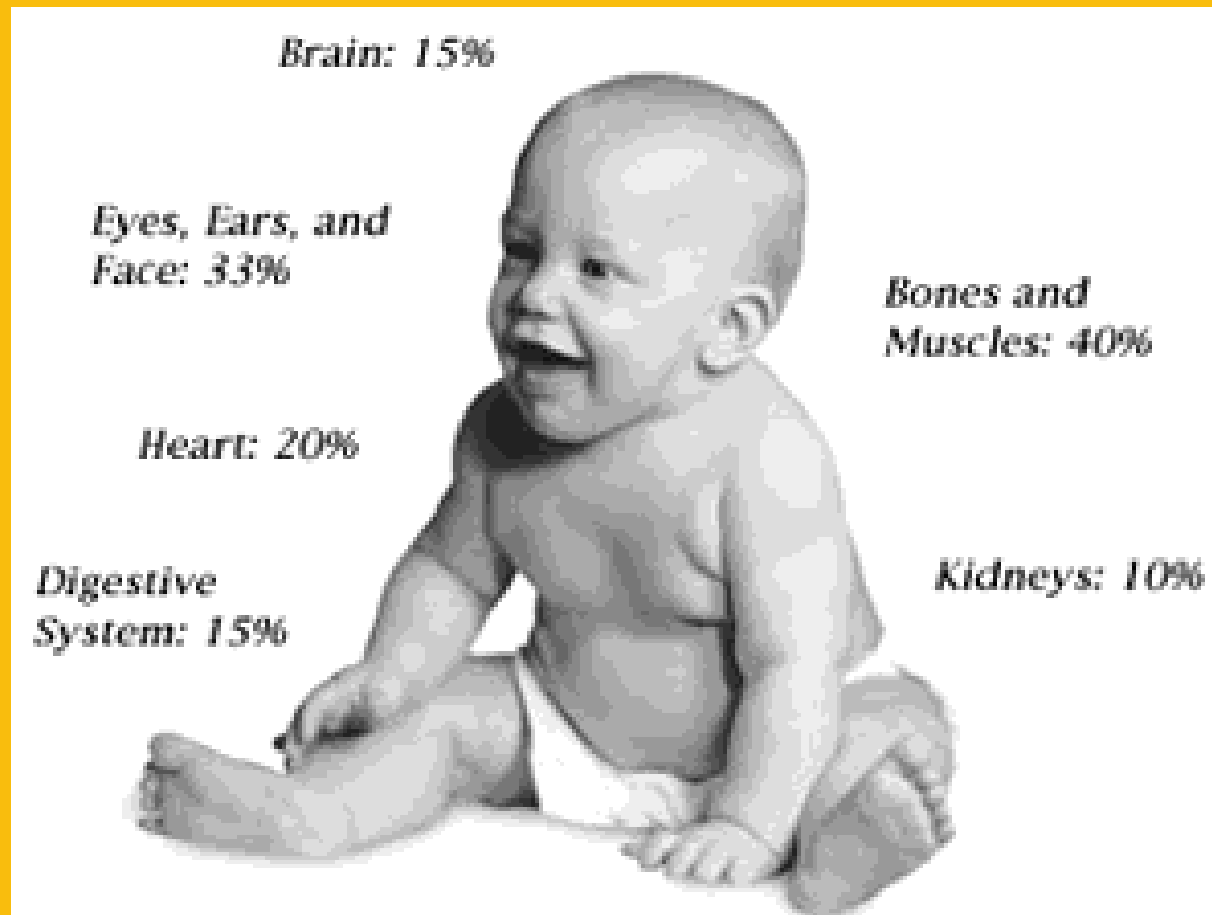


# **Reproductive and Developmental**

## **Outcomes**

- ◉ **No baby**
  - ◉ **Can't conceive (10% of all couples)**
  - ◉ **Can't bring to term**
- ◉ **Damage to baby**
  - ◉ **Anatomic defect**
  - ◉ **Functional defect**
  - ◉ **Ongoing poisoning**
- ◉ **Unfavorable sexual function**

# Sites of Birth Defects



# What determines the effect?

- ⊙ **Agent: How toxic?**
  - ⊙ ex: X-rays vs radioactive iodine

- ⊙ **Dose: How much?**

- ⊙ Maternal vs Fetal

- ⊙ **Route**

- ⊙ **Genetic factors of the parents and fetus**

- ⊙ ex: fetal alcohol syndrome

- ⊙ **Gestational age of fetus at time of exposure is critical**



# **When is the greatest risk?**

## **◎ First Trimester**

- ◎ Greatest risk at 4-9 weeks gestation**
- ◎ Most susceptible to what causes physical defects**
- ◎ Delay in normal growth and development**

## **◎ Fourth month to Birth**

- ◎ Defects in Brain Development**
- ◎ Low Birth Weight**
- ◎ Urinary and Reproductive System Development**



# **Specific Conditions that can Result from Hazardous Toxicants**

- ◎ **Reduced Libido**
- ◎ **Infertility**
- ◎ **Menstrual Disorders**
- ◎ **Spontaneous Abortion**
- ◎ **Birth Defects**
- ◎ **Low Birth Weight**
- ◎ **Functional Deficits**

# **What Potentially Harmful Agents are in Military Settings?**

- ⊙ **Anesthetic Gases**
- ⊙ **Antineoplastic drugs**
- ⊙ **Carbon Monoxide**
- ⊙ **Lead**
- ⊙ **Radiation**
- ⊙ **Vibration**
- ⊙ **PCBs**
- ⊙ **Organic Mercury**
- ⊙ **Fuels/JP-8**
- ⊙ **Physical stress**
- ⊙ **Organic Solvents**
- ⊙ **High Altitude**

# Classic Infectious Teratogens

<b>Disease</b>	<b>Birth Defects</b>
<b>Rubella</b>	<b>Cataracts, glaucoma, heart defects, deafness</b>
<b>Cytomegalovirus</b>	<b>Microcephaly, blindness, mental retardation</b>
<b>Herpes simplex</b>	<b>Microphthalmia, microcephaly, retinal dysplasia</b>
<b>Toxoplasmosis</b>	<b>Hydrocephalus, cerebral calcifications, microphthalmia</b>
<b>Syphilis</b>	<b>Mental retardation, deafness</b>
<b>Varicella</b>	<b>Cortical atrophy, seizures, chorioretinitis, cataracts, microphthalmia, hypotrophic limbs, hemiatrophy, skin lesions</b>

# Protection From Common Infectious Hazards

- ◎ **Cytomegalovirus (CMV)**
- ◎ **Hepatitis B**
- ◎ **Hepatitis C virus (HCV)**
- ◎ **HIV**
- ◎ **Parvovirus B 19**
- ◎ **Rubella**
- ◎ **Toxoplasmosis**
- ◎ **TB**
- ◎ **Chickenpox / Zoster**
- ◎ **Immunizations - avoid live virus vaccine in pregnant women**

# Chemical Exposure

**Evaluate hazard, not just toxicity. Don't recommend exposure > 10% of PEL.**

**The following chemicals are always bad:**

- ⊙ Chemotherapeutic agents
- ⊙ ACE Inhibitors
- ⊙ Benzodiazepines
- ⊙ Steroid hormone
- ⊙ Vitamin A derivatives
- ⊙ Carbaryl
- ⊙ Ethanol
- ⊙ Dowanols / glycol ethers
- ⊙ Nickel
- ⊙ Xylene
- ⊙ Any heavy metal:  
Lead, Mercury,  
Cadmium
- ⊙ DBCP
- ⊙ PCBs
- ⊙ Toluene
- ⊙ Ionizing radiation
- ⊙ Urethane (not  
polyurethane)
- ⊙ Vinyl chloride

# Other Hazards

- ◎ **Overtime/prolonged hours**
- ◎ **Rotating Shift Work**
- ◎ **Video Display Terminals** (link is very weak)
- ◎ **Lifting, repetitive**
- ◎ **Prolonged Standing**
- ◎ **Heat**
  - ◎ **Core temperatures >39 C**
  - ◎ **Pregnant workers may be intolerant**

# **Laws and Reproductive Health**

- ◎ **Occupational Safety and Health Act of 1970**
- ◎ **OSHA Hazard Communication Standard**
- ◎ **EPA Regulations**
- ◎ **Title VII- Civil Rights Act: Pregnancy treated as a medical condition / Pregnancy Discrimination Act**
- ◎ **Family Leave Act**
- ◎ **Johnson Controls Decision**
- ◎ **Worker's compensation**

# **Clinical Evaluation/Management**

## **What the Health Professional Must Do**



- ◎ **Evaluate Risk**
- ◎ **Determine Interventions**
  - ◎ **Reduce the level of exposure**
  - ◎ **Provide treatment and follow-up**
- ◎ **Educate the patient and employer**



# Key Concept

**For risk to exist,  
three factors must be present**



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**Source**

**Pathway**

**Patient**

**If any factor is missing, there is no risk**

# **NIOSH Guidelines**

- ① **Obtain ob, medical and occupational history**
- ① **ID medical/ob conditions that prevent work**
- ① **ID work exposures and physical activity**
- ① **Modify work to eliminate or reduce exposures or other environmental factors that threaten pregnancy**

**\*NIOSH considers repro disorders among top ten occupational illness/injuries**

# Evaluating Hazards

## ◎ Step 1: Hazard Identification

- ◎ Patient Interview - Occupational and environmental history

## ◎ Step 2: Exposure Assessment

## ◎ Step 3: Estimate the likelihood of harm

## ◎ Step 4: Recommendations

- ◎ Job modification
- ◎ Personal protective equipment
- ◎ Temporary Reassignment/leave

# Evaluating Hazards

## ⊙ High Concern Situations

- ⊙ Substances known to cause harm
- ⊙ Substances probably harmful to reproduction based on animal studies
- ⊙ Substances that cause harm at levels of exposure which do not cause signs of toxicity in the worker
- ⊙ Agents which cause harm at levels of exposure near those found in the workplace

# **AMA Guidelines for Job Tasks - Uncomplicated Pregnancy**

<b><u>Task</u></b>	<b><u>OK Until Week</u></b>
<b>Clerical, managerial, sitting</b>	<b>40</b>
<b>Standing</b>	
<b>Prolonged (&gt;4 hours)</b>	<b>24</b>
<b>Intermittent</b>	
<b>More than 30 min/hr</b>	<b>32</b>
<b>Less than 30 min/hr</b>	<b>40</b>

# **AMA Guidelines for Tasks -Uncomplicated Pregnancy**

## **Task OK Until Week**

### **Stooping and bending**

**Repetitive (>10/hr)      20**

**Intermittent 2-10/hr      28**

**Intermittent <2/hr      40**

### **Climbing (vertical)**

**>4 times shift      20**

**<4 times shift      28**

### **Stairs**

**> 4 times/shift      28**

**< 4 times/shift      40**

# **AMA Guidelines for Tasks -Uncomplicated Pregnancy**

<b><u>Task</u></b>	<b><u>OK Until Week</u></b>
<b>Lifting</b>	
<b>Repetitive</b>	
<b>&gt;50 lb</b>	<b>20</b>
<b>25-50 lb</b>	<b>24</b>
<b>&lt;25 lb</b>	<b>40</b>
<b>Intermittent</b>	
<b>&gt;50 lb</b>	<b>30</b>
<b>25-50 lb</b>	<b>40</b>

# **Third Trimester Considerations**

- ⦿ **Lifting at increased distance from body significantly increases stress to lower back**
  - ⦿ **Avoid bulky packages, awkward, or confined spaces**
  - ⦿ **No repetitive lifting more than 10 pounds**
- ⦿ **Work Requiring Balance**
  - ⦿ **Avoid climbing ladders, scaffolding**
- ⦿ **No prolonged standing more than 3 hours per day**
- ⦿ **Noise no more than 85dB**



# **Hours and Shift Rotations**

- ⊙ **Consider the activity level of the worker**
- ⊙ **Consider any complaints or concerns by the worker seriously**
- ⊙ **Consider all current and historic obstetrical problems**
- ⊙ **History of pregnancy complications**
- ⊙ **No >40 hour work week in last trimester**

# **Strong Indications for Temporary Transfer**

- ⊙ **Waste anesthetic gasses (w/o) complete scavenge**
- ⊙ **Lead (blood > 30 ug/dl)**
- ⊙ **Direct use of organic mercury**
- ⊙ **Radiation > 0.5 rem**
- ⊙ **Cytotoxic agents w/o hood/PPE**
- ⊙ **Organochlorine & organophosphorus pesticide application**
- ⊙ **Child or patient care (If sero-negative) during an outbreak of:**
  - ⊙ **Rubella**
  - ⊙ **Varicella**

# **Relative Indications for Temp Transfer or Job Modification**

- ⊙ **Significant exposure to vibration, temperature, and altitude extremes**
- ⊙ **Carbon monoxide exposure if CoHB > 5%**
- ⊙ **Glycol ethers**
- ⊙ **Organic solvents**
- ⊙ **PCBs, PBBs, DDT**
- ⊙ **Child or patient care (If sero-negative) during an outbreak of:**
  - ⊙ **Parvovirus B-19**
  - ⊙ **CMV**

# Household Activities/ Hobbies to Avoid

- ◎ Painting
- ◎ Removal of old paint
- ◎ Stripping furniture
- ◎ Glazing ceramics
- ◎ Photo processing
- ◎ Stained glass and jewelry making
- ◎ Emptying kitty litter boxes
- ◎ Hair coloring



# Guidelines for Breast Feeding

- For most workers, benefits of feeding far outweigh risks

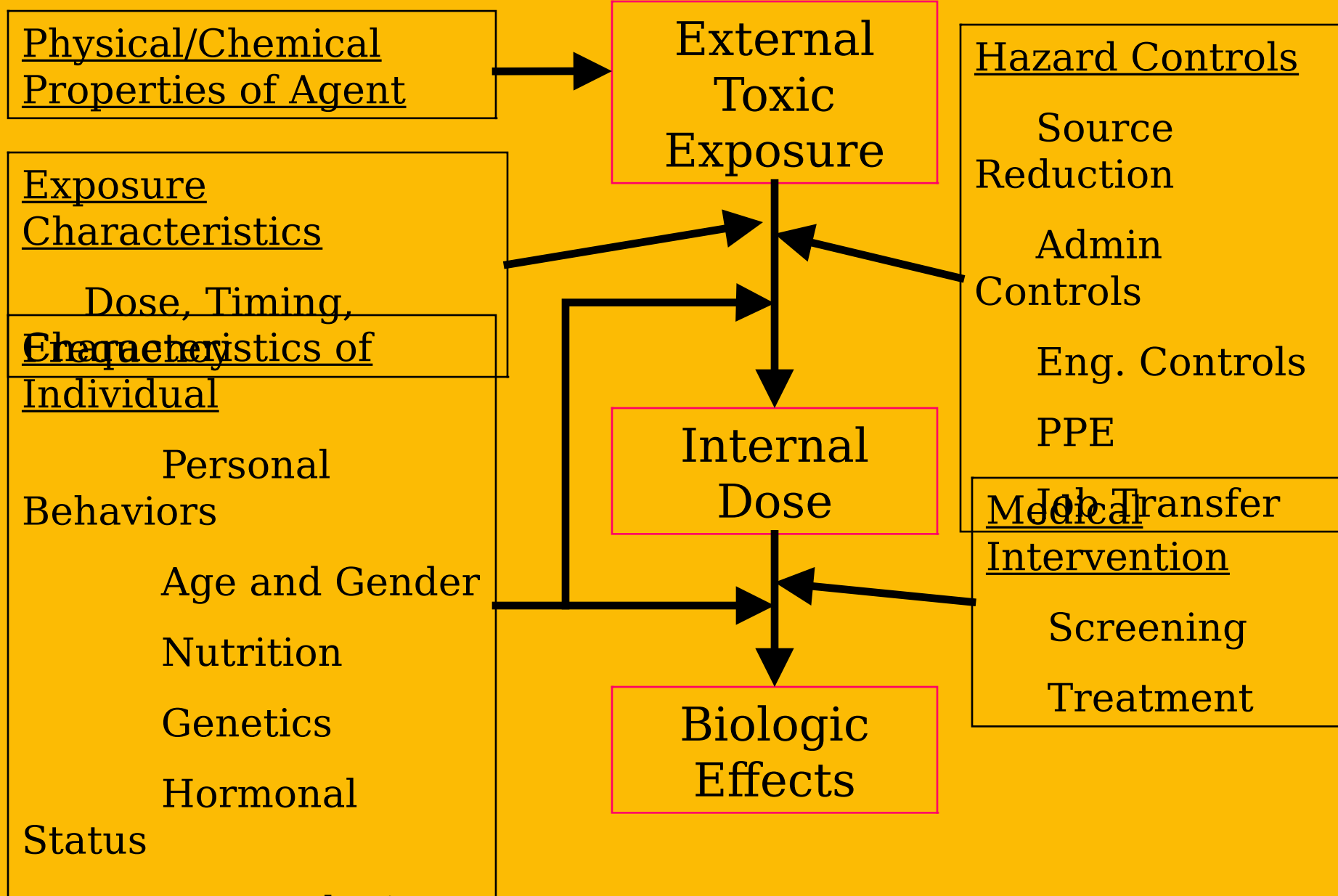


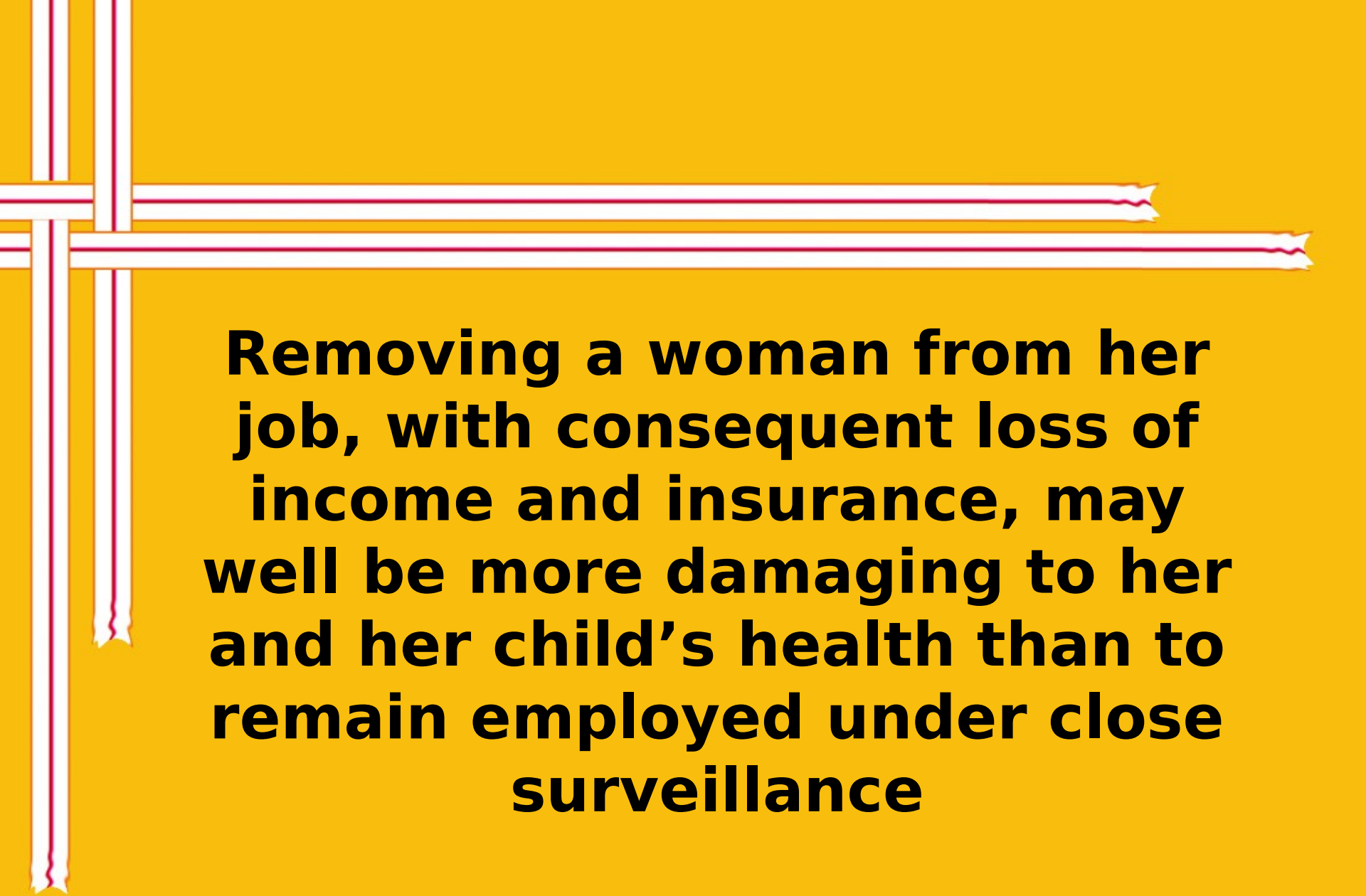
- Some harmful contaminants are concentrated in breast milk

# **Guidelines for Breast Feeding cont.**

- ① **Avoid breastfeeding if:**
  - ① **Maternal levels of lead, cadmium, or mercury are above normal**
  - ① **Mother has occupational exposure to PCB's, PBB's, or organochlorine pesticides**
  - ① **Mother has occupational exposure to low molecular weight carcinogens**
- ① **Stop breast feeding for 3-4 days after maternal exposure to solvents**

# Putting It All Together





**Removing a woman from her job, with consequent loss of income and insurance, may well be more damaging to her and her child's health than to remain employed under close surveillance**

**Occupational and Environmental Reproductive Hazards: A Guide for Clinicians, Maureen Paul, Williams and Wilkins,**



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# Questions

**Occupational Medicine  
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